

## 2 SITE ASSESSMENT AND BMP SELECTION

### 2.1 Assessing Site Conditions and Other Constraints

An integral step in designing a site that incorporates an appropriate combination of post-construction storm water BMPs (including site design, basic BMPs, and storm water runoff BMPs as discussed in Chapters 4 through 6) as required by project tiers, is assessing the existing site conditions. Whether a site is being developed for the first time or is being redeveloped, there are multiple opportunities in the development process to incorporate post-construction storm water BMPs to enhance the hydrologic and ecological functionality of a site and meet project tier requirements (See Section 1.3).

**The maps in Appendix B should be used to identify possible site constraints early in the process** before (not in lieu of) the required soil assessment (Chapter 3), to get a general idea of local conditions. The maps in Appendix B provide general information on the distributions of hydrologic soil types and percent slope ranges, as well as the approximate locations of the Hillside Design and Coastal Bluff Districts. The information in these tables and figures provides general guidance on site characteristic trends within the City; however, verification of characteristics that are integral to a BMP must be conducted independently to account for site specific characteristics.

In order to select appropriate BMPs and possible locations for them, the designer must accurately assess the specific existing site conditions. A comprehensive site assessment that identifies critical site characteristics is integral to the successful design and implementation of all types of post-construction storm water BMPs. While the information gathered during the site assessment may not need to be submitted to the City (depending on tier and type of information gathered), it will assist in determining which types of BMPs may be implemented, combined, and located throughout the site. For Tier 3 projects, one or more qualified professionals (e.g., civil engineer, landscape architect, certified storm water professional, and/or geotechnical engineer) should conduct the site assessment evaluating existing conditions, including the site's hydrology, topography, soils, and vegetation. Types of information that are required for the site designer, though not all are required to be provided to the City, and are typically included in the site assessment are shown in Table 2-1 below.

**Table 2-1: Typical Site Assessment Information**

Assessment Category	Type of Information
Existing Hydrology/Hydrography	<ul style="list-style-type: none"> <li>• Site drainage patterns</li> <li>• Flood hazards</li> <li>• Depth to groundwater</li> <li>• Connections to the storm drain system</li> <li>• Nearby waterways (including receiving water quality and hydraulic conditions)</li> <li>• Locations of any seeps or springs</li> </ul>

Assessment Category	Type of Information
Existing Topography	<ul style="list-style-type: none"> <li>• Surface drainage paths</li> <li>• Locations of local high and low points</li> <li>• Significant geologic features</li> <li>• Steep slopes and/or cliffs</li> </ul>
Existing Soils	<ul style="list-style-type: none"> <li>• Identification of soil types (hydrologic soil group)</li> <li>• Permeability</li> <li>• Site susceptibility to erosion, landslides, and other geotechnical hazards</li> <li>• Depths of subsoil</li> </ul>
Existing Vegetation	<ul style="list-style-type: none"> <li>• Types and relative amounts</li> <li>• Estimate of site evapotranspiration rate</li> <li>• Identify weed species</li> <li>• Identify sensitive species</li> </ul>
Climate conditions	<ul style="list-style-type: none"> <li>• Average precipitation</li> <li>• Seasonal variation in precipitation</li> <li>• Temperature range</li> </ul>
Local Regulatory	<ul style="list-style-type: none"> <li>• Municipal zoning ordinances</li> <li>• Design standards</li> <li>• Design guidelines</li> </ul>
Local Services/Utilities	<ul style="list-style-type: none"> <li>• Proximity of utilities to site (including locations if on-site)</li> <li>• Requirements of local services (e.g., fire safety)</li> </ul>

In addition to assessing existing site conditions, it is imperative (to the designer) to determine other constraints that will dictate design and implementation of post-construction storm water BMPs. Other important factors that may constrain design and implementation are the initial capital costs, the reliability of selected BMPs, the need to meet specific reduction goals for specific pollutants of concern (see Section 2.2 and Tables 2-2 and 2-3), the need to meet the storm water runoff requirements for Tier 3 projects (Section 6.2), and on-going long-term maintenance that may be required. BMPs shall be selected based on the probability of long-term success including site specific factors that may contribute to or reduce the chance of failure of a given BMP to function properly (hydraulically and performance wise).

## 2.2 Assessing Pollutants of Concern

An important step in minimizing runoff pollution is identifying the pollutants of concern. The City of Santa Barbara has been conducting water quality monitoring programs since 1998. From these studies, the City has identified local pollutants of concern, both known and suspected, that must be considered when selecting BMPs. The City of Santa Barbara's SWMP lists seven pollutant groups as either known or suspected pollutants of concern. These pollutants can typically be related to land use, which means that the developed condition of the site provides some indication of the pollutants that will be generated, post-construction. Table 2-2 identifies pollutants of concern based on post-construction project land use. Table 2-2 provides general guidance; however, based on specific site characteristics or type of activity, pollutants of concern may be different from shown. Additional pollutants of concern may be

identified based on specific site characteristics, such as known soil contaminants in redevelopment sites or specific proposed site activities. BMPs shall be selected to address, at minimum, the pollutants of concern listed in Table 2-2 for the proposed land use(s) as well as those listed in Table 2-3 for 303(d) listed water bodies (i.e., surface waters listed by the State as “impaired” for certain pollutants of concern) that receive runoff from the project site.

**Table 2-2: Pollutants of Concern Based on Land Use**

Land Use	Pollutant Category of Concern						
	Trash	Nutrients	Bacteria	Metals	Sediment	Other	
						Hydrocarbons	Pesticides and Herbicides
Commercial, Institutional, and Mixed-Use Developments	✓	✓	✓		✓	✓	✓
Industrial	✓	✓	✓	✓	✓	✓	✓
Roads and Parking Lots	✓	✓		✓	✓	✓	✓
Restaurants	✓	✓	✓			✓	
Automotive	✓			✓		✓	
Multi- and Single-Family Residences (Including Subdivisions)	✓	✓	✓		✓	✓	✓
Hillside Developments	✓	✓			✓	✓	✓

All of the pollutants of concern categories are described below, including common sources and common problems they cause.

### ***Trash***

The trash category includes debris and floatables. Trash enters storm water through streets and storm drain inlets, areas with high pedestrian traffic, and poor landscape maintenance practices. Not only are gross pollutants unsightly, but they may also interfere with oxygen exchange, carry bacteria, and cause vector problems.

### ***Nutrients (Nitrogen and Phosphorus)***

Potential sources of nutrients in storm water include fertilizer use (public and private), discharge of wash water that contains soaps and detergents (variety of sources including restaurants, commercial properties, and residential car washing). High nutrient concentrations may cause accelerated or excessive growth of algae and eutrophication in lakes and other water sources. In addition, a form of nitrogen may be toxic to fish.

***Bacteria***

Indicator bacteria (e.g., total/fecal coliform, *E. coli*, and enterococcus) are used to infer the presence of pathogenic organisms that are fecal in origin. Indicators are necessary due to difficulties in measuring pathogen concentrations directly. Potential sources of indicator bacteria include human excrement (from either direct deposit or leaking sewage or septic systems), animal excrement (both domestic and wild), and outdoor restaurant washing. High concentrations of indicator bacteria (i.e., those that exceed recreational contact standards) trigger the closure of beaches, lakes, and rivers.

***Metals***

In general, metals that can be found in storm water include cadmium, chromium, copper, lead, nickel, and zinc. Metals that have been identified as pollutants of concern by the City in storm water include magnesium, zinc, potassium, and iron. Potential sources include naturally occurring metals, automobiles, illegal or improper disposal of lead batteries, and many common materials (e.g., galvanized metal, paint, preserved wood, etc.). Metals can be toxic to aquatic organisms and contaminate drinking water supplies. Bioaccumulation is also a problem for some metals because as they accumulate in the tissues of organisms lower in the food chain they may potentially result in elevated levels in larger organisms that feed on them, which are food sources for humans.

***Sediment***

The City has identified natural erosion, dirt roads, creek side development, construction, land development, and agriculture as potential sources of sediment. While construction runoff is managed under a different program, land development and agriculture are the main sources that should target sediment when selecting BMPs. High sediment concentrations not only make the water appear murky, but also tend to carry adsorbed pollutants with them. In addition, downstream sedimentation may threaten fish and other aquatic life by interfering with respiration, growth, reproduction, photosynthesis, and oxygen exchange.

***Hydrocarbons***

Oil and grease enter storm water through a variety of mechanisms and sources, including automotive sources, leakages/spills, parking lots, restaurants, and illegal or improper disposal. Some of the hydrocarbons that are found in oil and grease are toxic to aquatic organisms and produce unsightly sheens, even at low concentrations. Some also present bioaccumulation risks.

***Pesticides***

Landscaped areas are potential sources of pesticides entering storm water. Pesticides include insecticides, herbicides, fungicides, and rodenticides. Some pesticides are toxic to aquatic organisms, even at low concentrations, and can bioaccumulate. Several chemical formulations are banned but even some allowed pesticides still present toxicity risk to aquatic organisms.

**Table 2-3: 303(d) Listed (2006) Water Bodies and Associated Pollutants**

303(d) Listed Water Body	Pollutant Category of Concern				
	Bacteria	Metals	Sedimentation and Siltation	Priority Organics	Unknown <sup>1</sup> Toxicity
Arroyo Burro Creek	✓				
Goleta Slough	✓	✓	✓	✓	
Mission Creek	✓				✓
Pacific Ocean at Arroyo Burro Beach	✓				
Pacific Ocean at East Beach (mouth of Mission Creek)	✓				
Pacific Ocean at East Beach (mouth of Sycamore Creek)	✓				
Pacific Ocean at Hope Ranch	✓				
Pacific Ocean at Leadbetter Beach	✓				

<sup>1</sup> Toxicity should be equated to metals and priority organics from Table 2-2.

The pollutants in the City's water bodies that are listed on the 2006 303(d) list as shown in Table 2-3, above, have been attributed to urban runoff, non-point sources, industrial point sources, and construction and land development.

## 2.3 BMP Selection Process

Important factors that may constrain BMP selection are the initial capital costs, the reliability of selected BMPs, the need to meet specific reduction goals for specific pollutants of concern (see Section 2.2), the need to meet the storm water runoff requirements for Tier 3 projects (Section 6.2), and on-going long-term maintenance that may be required. BMPs shall be selected based on the probability of long-term success including site specific factors that may contribute to or reduce the chance of failure of a given BMP to function properly (hydraulically and performance wise).

BMPs shall be selected based on the following items to the maximum extent practicable:

1. site specific constraints;

2. pollutants of concern based on proposed land use type and receiving water conditions;
3. low impact development principles and practices (see Section 1.2.1);
4. meeting the post-construction storm water requirements based on project tier (see Section 1.3);
5. cost considerations; and
6. long-term maintenance considerations.

Targeting specific pollutants of concern based on proposed land use and known site contaminants is required. Site and soil assessment information (Chapters 2 and 3) shall be used in combination with the BMP matrix tables: Table 5-1, Table 6-1, Table 6-2 (Chapters 5 and 6, respectively), to determine appropriate BMPs for a given site.